its plates, which are charmingly reproduced direct from drawings by the best bird artists of the day, the extensive series of photogravures engraved from the author's photographs of the haunts of the various species, and the graphic and popular descriptions of their habits from studies made amid their native wilds. These and other features render the work far in advance of all other books written on the subject, and make it welcome alike to the ornithologist, the aviculturist, and the sportsman.

In order to carry out the author's ideals of what a monograph should be, an expedition was organised to visit the metropolis of pheasantdom in temperate and tropical Asia, where, in Ceylon, India, Burma, China, Japan, the Malay States, Borneo, and Java, seventeen months in all were spent. That such an expedition should have been possible was due to the generosity of Col. Anthony R. Kuser, of Bernardsville, New Jersey, to whom and his wife the work is fittingly dedicated. But this is not all. With the view of supplementing first-hand knowledge, Mr. Beebe visited a number of the leading museums in Europe in order to study specimens in their cabinets and to consult their libraries.

The scope of the work may well be described as exhaustive. The introduction embraces a general account, including the historical aspect of the subject from the earliest times, classification, distribution, comparative abundance, voice, flight and gait, daily round of life (food, roosts, friends and foes), protective coloration, home life, and relation to man. Under the last heading it is distressing to learn that even in their remote haunts amid the highest mountains of the Old World these birds, mainly from the remarkable beauty of their plumage, are rapidly becoming extinct through persecution. Mr. Beebe tells us that for many years they have paid a heavy toll to the millinery trade. It is known, for example, that some years ago 45,000 Impeyan pheasants had been slaughtered; Mr. Beebe himself has seen huge bales of feathers of the silver pheasant, and Nepal and China still export large quantities. Now that the Chinese have adopted a meat diet, pheasants are no longer immune, save where Buddhists and Hindus hold sway, and they are everywhere trapped, snared, pierced with poisoned arrows from crossbow or blowpipe, or slain by repeating shot-guns. It is gratifying to know that in the British-governed regions they are protected by well-regulated game laws, and the brooding hens and chicks are free from persecution. In this connection it is important to learn that the birds do very little damage to crops, and when they appear among them it is insect life which is the main attraction.

As regards the classification of the family, the grouping of the numerous genera under sub-families has never been satisfactory. Mr. Beebe, however, after much careful study, discovered a new character—namely, the "regular sequence in the moulting of the tail feathers," which holds good throughout the life of the bird, and agrees also with "assumed relationships which had hitherto been taken for granted." The following are the sub-families adopted: Perdicinæ, Phasianinæ, Argusianinæ, and Pavoninæ; and the various genera grouped under them are indicated. Since our author includes the Perdicinæ in his scheme, yet treats of only two of its genera, namely, Ithagenes and Tragopan, omitting many others, the work can scarcely be regarded as a complete treatise of "The Pheasants of the World." It will deal, however, with nearly one hundred forms.

The systematic treatment of the subject is on the same exhaustive lines. The volume already issued treats of twenty-one species: the blood pheasants (Ithagenes), the Tragopans or horned pheasants (Tragopan), the Impeyans (Impeyanus), and the eared pheasants (Crossoptilon). For each of these species are given the generic and specific characters; scientific, English, native, French, and German names; full descriptions of the various stages of plumage, moults, variation, hybrids, parasites, internal anatomy, characteristics as observed in their haunts, geographical distribution, migrations, food, nests and eggs. It is embellished with twenty-two coloured plates by Messrs. A. Thorburn, G. E. Lodge, C. R. Knight, and H. Gronvold, fifteen photogravures, and five maps. The volume is sumptuous in all respects except the binding, which does not come up to the standard of the rest.

While Mr. Beebe's fine work merits the highest praise, it is greatly to be regretted that its price (50*l.*) places it beyond the reach of the vast majority of those who would appreciate and use it. W. E. C.

OUR BOOKSHELF.

An Elementary Treatise on Curve Tracing. By Dr. P. Frost. Fourth edition, revised by Dr. R. J. T. Bell. Pp. xvi+210. (London: Macmillan and Co., Ltd., 1918.) Price 12*s.* 6*d.* net.

EVERY mathematician will welcome this new edition of a classical work if only as an indication that the demand for it has not diminished since it was originally published, forty-six years ago. Although the modern tendency is away from the excessive zeal for examples and exercises of a past generation, the mathematical student will derive much benefit from excursions on this "very pleasant path, on which he may exercise in an agreeable way all his mathematical limbs," especially as curve plotting is a necessity in all branches of modern science. A valuable feature of the book is the sketch of the inverse process of finding the equation of a curve the graph of which is given. Further work on this branch of the subject would be very useful.

This is the first revised edition; the second and third issues were mere reprints of the first edition. The editor has discharged his duties with restraint, and he has introduced several improvements. The printing is more compact and the use of leaded type conduces to comfort in reading. Additional

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explanatory matter has been inserted occasionally, and the examples have been much improved by the inclusion of hints for their solution. In one or two places the clearness of the original is somewhat marred, as, *e.g.*, on p. 91, where two different notations are used simultaneously. It is not always obvious why formulæ have been banished from the text to separate lines, and *vice versa*; but this is a question of taste. The plates have been touched up here and there, and occasionally corrections have been made, *e.g.* ix., 3, 5; xiv., 10, 18.

It is surprising that the editor has retained the definition of curvature as measured by the *diameter of curvature*, whilst in at least one place he has used the first person in an interpolated remark.

The index and the classified list of curves are welcome additions. S. Brodetsky.

An Account of the Crustacea of Norway. With short descriptions and figures of all the Species. By Prof. G. O. Sars. Vol. vi., "Copepoda, Cyclopoida." Parts 9–14. Pp. 105–225 + 54 plates. (Bergen: Published by the Bergen Museum, 1915–18.)

With the issue of the six parts noted above, Prof. Sars concludes the sixth volume of his great work on the Crustacea of Norway, the third of the series to be devoted to the rich and varied group of the Copepoda. This volume deals with the division Cyclopoida, which includes, for the most part, bottom-haunting species, many of them parasitic or semi-parasitic. Like the Harpacticoida treated of in the preceding volume, they are rarely found in the plankton, and must be sought for by special methods of collecting demanding much skill and patience. For this reason they have received far less attention than the relatively few species that are captured in bulk by the tow-net, and the proportion of novelties described in these volumes is very high. It is scarcely too much to say that Prof. Sars is giving us, for the first time, the means of forming a just impression of the Copepoda as a whole, both as regards their structural diversity and their habitats and distribution in northern seas. The species living in fresh water were previously better known, but here also Prof. Sars's accurate drawings will greatly facilitate the identification of species.

Apart from the faunistic value of the work, however, the iconography which it provides for many groups hitherto sadly in want of illustration will be of the greatest value to the morphologist and taxonomist. Among the numerous points of interest touched on in the parts under review, it may be noted that Prof. Sars revives Thorell's group of the Poecilostoma, although in a restricted sense and a subordinate position. In doing so he discards Claus's interpretation of the mouth-parts and reverts to that originally given by Thorell, according to which the mandibles, elsewhere so persistent, have entirely disappeared in the species composing this aberrant group.

W. T. C.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

The Perception of Sound.

I regret that I overlooked Prof. Bayliss's letter in Nature of October 17, in which he made an appeal for my opinion. But, if I rightly understand, the question at issue seems to be mainly one of words. Can we properly speak of the propagation of sound through an incompressible fluid? I should answer, Yes. There may be periodic motion and periodic variation of pressure; the fact that there are no variations of *density* seems immaterial. Consider plane waves, corresponding with a pure tone, travelling through air. In every thin layer of air—and thin means thin relatively to the wave-length—there are periodic motion and periodic compression, approximately uniform throughout the layer. But the compression is not essential to the travelling of the sound. The substitution of an incompressible fluid of the same density for the gas within the layer would be no hindrance. Although there is no compression, there remain a periodic pressure and a periodic motion, and these suffice to carry on the sound.

The case is even simpler if we are prepared to contemplate an incompressible fluid without mass, for then the layer need not be thin. The interposition of such a layer has absolutely no effect, the motion and pressure at the further side being the same as if the thickness of the layer were reduced to zero. To all intents and purposes the sound is propagated through the layer, though perhaps exception might be taken to the use of the word *propagation*.

As regards the ear, we have to consider the behaviour of water. From some points of view the difference between air and water is much more one of density than of compressibility. The velocities of propagation are only as 4 or 5 to 1, while the densities are as 800 to 1. Within the cavities of the ear, which are small in comparison with the wave-lengths of musical sounds, the water may certainly be treated as incompressible; but the fact does not seem to be of fundamental importance in theories of audition. Rayleigh.

Terling Place, Witham.

The Common Cause of Pure and Applied Science.

A good deal of anxiety has been expressed recently in various quarters lest the great interest now being evinced in applied science may perpetuate, or even aggravate, the national neglect of pure science. As I do not share this anxiety, but, on the contrary, am strongly convinced that exactly the opposite effect will ensue; and as there seems to be some danger in the attitude that is being assumed by certain of my friends, I should like, with great respect, to ask for attention to the considerations which have led me to these opinions.

For many years past there has been in this country what the late Lord Armstrong once well called "a vague cry for technical education," a dim feeling on the part of the industrial world, collectively speaking (there have, of course, been brilliant individual exceptions), that there was some business-end of science that was worth getting hold of, and that should be got on easy terms of talent, time, and money. We know what it has failed to produce in institutions, in individuals, and in industrial efficiency; and we knew

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